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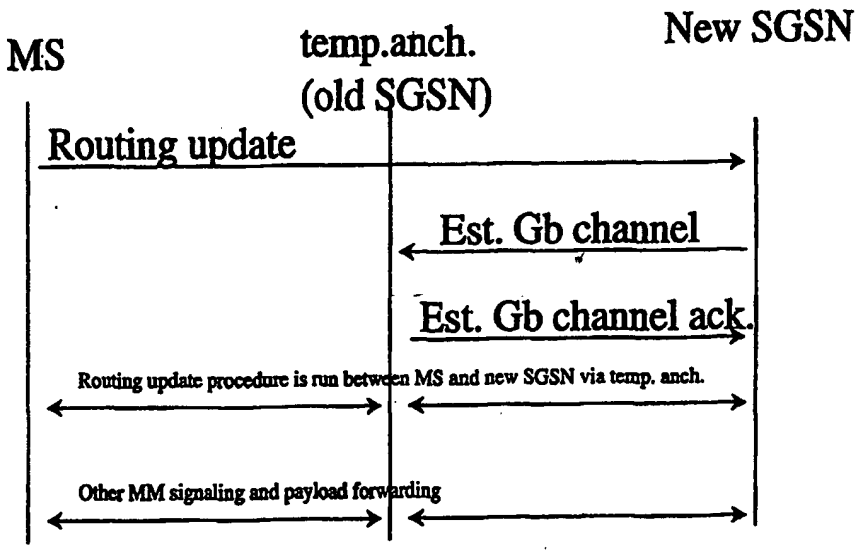

(57) Abstract

The present invention relates to a method for improving the handing over of a connection from one SGSN (I) to another, i.e. when an MS (Mobile Station) moves from one SGSN service area to another, and for the purpose of not interrupting the packet transmission and possible layer 3 procedures, and for optimizing the network utilization without adding complexity to SGSN, it is according to the invention suggested that at inter SGSN routing update, the old SGSN (I) is given the role as a temporary anchor whereas the other (new) SGSN (II) is temporarily working as a serving SGSN.

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METHOD FOR IMPROVING THE HANDING OVER A CONNECTION FROM ONE SGSN TO ANOTHER SGSN

Field of the invention

The present invention relates to a method for improving the handing over of a connection from one SGSN to another, i.e. when an MS (Mobile Station) moves from one SGSN service area to another.

Background of the invention

More specifically the present invention relates to GPRS service on GSM.

When a mobile station (MS) in active GPRS modus, i.e. transmitting information, moves from one SGSN service area to another, the packet transmission and possible layer 3 procedures should not be interrupted.

Due to the complex state machines for the layer 3 procedures, changing SGSN directly implies transmitting very large amounts of control data from one SGSN to another. Another problem is ongoing transactions with other network nodes which also has to be redirected to the new SGSN.

State of the art

GSM voice service uses an anchor concept to solve the problem. That means that in the network node (MSC/VLR) a connection is primarily established and is kept throughout the whole call. This node is entitled 'anchor MSC/VLR'. If the subscriber moves into another MSC/VLR's coverage area, the new MSC/VLR acts only as a transit node. This node is entitled 'serving MSC/VLR' whereas the

connection control still resides in the anchor MSC/VLR throughout the call.

Problems related to prior art

GPRS has no working solution on this problem yet. Due to the long connection times for GPRS (hours) compared to a circuit switched connection (minutes), a similar solution for GPRS may result in a great number of anchor-serving legs.

Objects of the invention

An object of the present invention is to provide a method for improving the handing over of a connection from one SGSN to another, whereby the packet transmission and possible layer 3 prosedures are not interrupted.

Another object of the present invention is to provide such a method by which the layer 3 procedures do not have to be designed for supporting inter SGSN routing update.

Still another object of the present invention is to provide a method by which the risk of losing payload packets is minimized.

Yet another object of the present invention is to provide a method by which the tunnelling of payload packets from one SGSN to another is not required, thereby simplifying the design necessary therefor.

Still another object of the present invention is to provide a method which optimizes the network utilization without adding complexity to SGSN.

Another object of the present invention is to provide a method by which the service degration when handing over a

connection from one SGSN to another is minimized as experienced from the MS point of view.

Brief disclosure of the invention

In a method as stated in the preamble, the above objects are achieved by the features as stated in the enclosed patent claims.

In other words, the present method suggests that at inter SGSN routing update, the old SGSN gets the role as a temporary anchor whereas the new SGSN works temporarily as a serving SGSN. This leg is kept as long connection control procedure are processing including data packet transmission. When all activities have ceased for the connection, i.e. no data transmission, no layer 3 procedures and no on-going transactions towards other networks nodes, the connection control is moved from anchor to serving SGSN.

The leg between anchor and serving SGSN is a Gb interface with minor modifications. Some control signalling is required to handle radio resources.

Further advantages and features of the present method will appear from the following description taken in conjunction with the appending drawings, as well as from the enclosed patent claims.

Brief disclosure of the drawings

Fig. 1 and Fig. 2 are signalling sequence layouts, illustrating the principle of how inter SGSN routing update is carried out in two steps.

Description of embodiments

As explained in the preamble, the present invention relates to a method method to "hand over" a connection from one SGSN to another without interrupting packet transmission and control signalling. The method allows the network to create a temporary leg between the old and the new SGSN. The temporary leg prevails until the state of the connection in the anchor SGSN can be securely transferred to the new SGSN while at the same time redirecting packet transfer to go directly from/to SGSN to/from the new SGSN.

With reference to Fig. 1 and Fig. 2 it is illustrated by means of a signalling sequence how the principle of inter SGSN routing update is carried out in two steps.

This construction has the advantage of not impacting ongoing layer 3 procedures and any payload transmission. Actually, the layer 3 procedures do not have to be designed to support inter SGSN routing update since the temporary Gb channel is not visible for layer 3. Today's solution in GPRS require that all layer 3 procedures must be designed to cater for an inter SGSN routing update.

Since the context take-over from temp. anchor to new SGSN takes place when the connection has entered a standby state, the risk for loosing payload packets is minimised. And since there is no traffic ongoing, the tunnelling of payload packets from temp. anchor to new SGSN is not required, thereby simplifying the design.

The temp. anchor principle also simplifies signalling to between SGSN and external nodes. Since the solution allows the connection to finish up ongoing transactions before moving the context to new SGSN, services such as

charging may be completed towards billing gateway in the normally manner before the context is moved to the new SGSN and charging is resumed.

Merits of invention

The solution optimises the network utilisation without adding complexity to SGSN. The subscriber will not experience any loss of service i.e., no retransmission peer to peer and no interrupted layer 3 procedures.

List of Abbreviations

GPRS - General Packet Radio Service
SGSN - Serving GPRS support node
GGSN - Gateway GPRS support node
MSC/VLR - Mobile Switching Centre/Visitor Location Register

Patent claims

1. Method for improving the handing over of a connection from one SGSN (I) to another, i.e. when an MS (Mobile Station) moves from one SGSN service area to another,
characterized in that at inter SGSN routing update, the old SGSN (I) is given the role as a temporary anchor, whereas the other (new) SGSN (II) is temporarily working as a serving SGSN.

2. Method as claimed in claim 1,
characterized in that at said inter SGSN routing update there is created a temporary leg between the old SGSN (I) and the new SGSN (II), said temporary leg being allowed to prevail as long as connection control procedure is upheld, including data packet transmission.

3. Method as claim in claim 1 or 2,
characterized in that the temporary leg is allowed to prevail until the state of the connection in the anchor SGSN (I) can be securely transferred to the new SGSN (II), while at the same time redirecting packet transfer to go directly from/to SGSN (I) to/from the new SGSN (II).

4. Method as claimed in claim 3,
characterized in that connection control is moved from said anchor SGSN (I) to said serving SGSN (II) when all activities for the connection have ceased, i.e. when no data transmission, no layer 3 procedure and no on-going transactions towards other network nodes prevail.

5. Method as claimed in any of the preceding claims,

characterized in that the leg between the anchor SGSN (I) and the serving SGSN (II) is created as a Gb interface with minor modifications.

6. Method as claimed in any of the preceding claims, characterized in that the inter SGSN routing update is carried out in a two step signalling sequence, and then without impacting on-going layer 3 procedures and any payload transmission, said temporary Gb channel not being visible for said layer 3.

7. Method as claimed in claim 6, characterized in that said signalling is carried out between SGSN and external nodes, allowing the connection in question to finish on-going transactions before moving the context to a new SGSN (II), services such as charging being completed towards billing gateway in a normal manner before the context is moved to the new SGSN (II) and charging resumed.

FIG.1

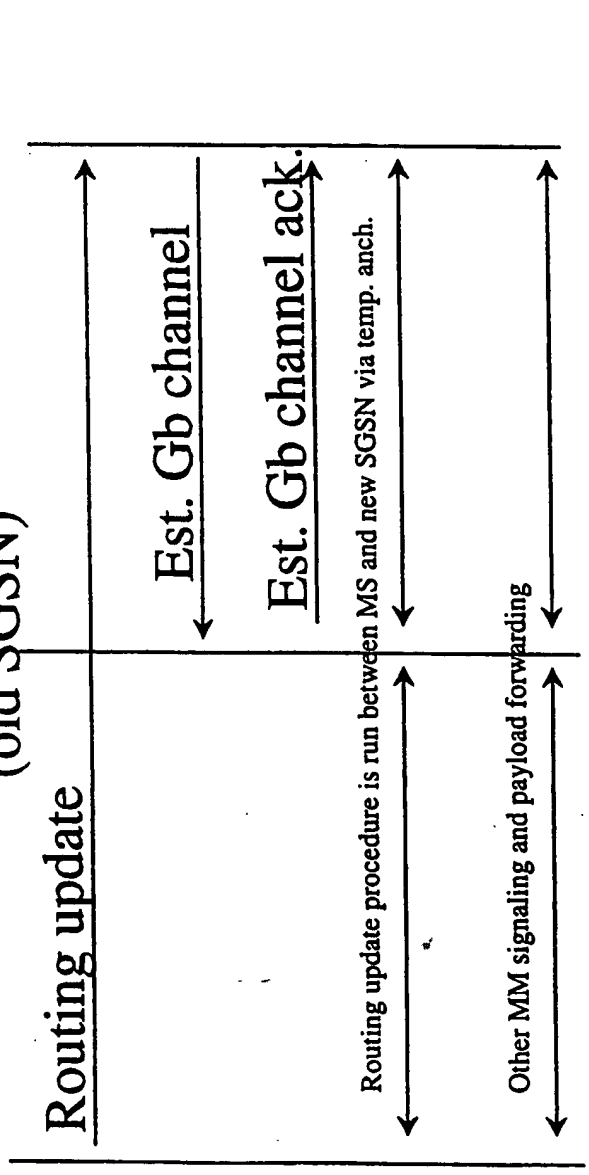
MS
temp.anch.
(old SGSN)
New SGSN
Routing update
Est. Gb channel
Est. Gb channel ack.
Routing update procedure is run between MS and new SGSN via temp. anch.
Other MM signaling and payload forwarding

FIG.2

When the connection enters standby state and no layer 3 procedures are ongoing the following procedure apply